Automated measurement of pig behavioural activity at pen level using image processing techniques

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Image processing techniques show great promise for the automated monitoring of animal behaviour. Such techniques could assist farmers in early detection of welfare and health problems in their livestock. Before applying such technology on-farm, however, the method ought to be well validated. The present study investigated for the first time the correspondence between automated measures of pig activity by image analysis and the behavioural activity as measured by a trained observer in a farm setting. Pigs were housed in 4 pens of 10 pigs and were video recorded by a top-view camera that covered an entire pen floor area. Pig behaviour was recorded during six days. On each of these days, four sessions of 30-min video recordings, two in the morning and two in the afternoon, were used for the comparison between the automated and human labelled data. A trained observer labelled pig activity in each session using 2-min instantaneous scan sampling. At each sampling point, each pig was scored as being behaviourally active when it was in locomotion (walking, running) and/or performing another activity (e.g. feeding, drinking, manipulating pen mate or pen fixtures, interacting socially). The behavioural activity scores of all individuals of a pen were averaged per session (6 days x 4 pens x 4 sessions = 96 data points). Automated pig activity was calculated by the relative number of moving pixels between two consecutive image frames (1 frame/second) and expressed as the average image activity index per session per pen. The automated activity measures were correlated to the human observations of pig behavioural activity. Automated activity measures were strongly correlated to the human observations ($N=96$, $r_s = 0.92$, $P<0.0001$). This result seems promising for the use of automated activity measures as a cost-effective tool to measure pig behavioural activity at pen level.